

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
11 March 2004 (11.03.2004)

PCT

(10) International Publication Number  
**WO 2004/020735 A1**

(51) International Patent Classification<sup>7</sup>: **D21F 1/00, 7/00**

(21) International Application Number:  
PCT/FI2003/000627

(22) International Filing Date: 27 August 2003 (27.08.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
20021535 28 August 2002 (28.08.2002) FI

(71) Applicant (for all designated States except US): **METSO  
PAPER, INC.** [FI/FI]; Fabianinkatu 9 A, FIN-00130  
HELSINKI (FI).

(72) Inventor; and

(75) Inventor/Applicant (for US only): **SAKARI, Vesa**  
[FI/FI]; Papurikonkatu 11, FIN-28220 PORI (FI).

(74) Agent: **OY JALO ANT-WUORINEN AB**; Iso  
Roobertinkatu 4-6 A, FIN-00120 HELSINKI (FI).

(81) Designated States (*national*): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, ES, FI (utility model), FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT (utility model), PT, RO, RU, SC, SD, SE, SG, SK (utility model), SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

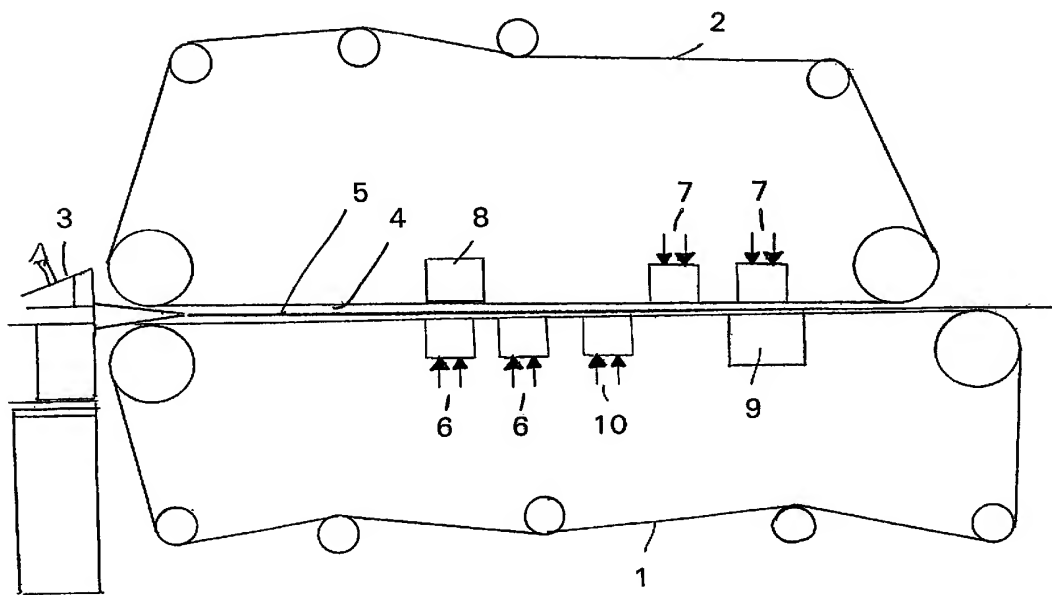
(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: METHOD FOR CONTROLLING THE TEMPERATURE OF A CELLULOSIC WEB ENTERING A DRYER



(57) Abstract: The invention relates to a method for controlling the temperature of a web (5), which is formed from cellulosic pulp and is to be passed to a dryer, by way of applying temperature-controlled liquid to the web. According to the invention, the thus formed web (5) is passed into a closed space (4) defined by two wires (1, 2) and side deckles, wherein temperature-controlled liquid (6, 7, 10) is applied at controlled pressure and flow rate through the wire (1, 2) to the web (5).

WO 2004/020735 A1

**Method for controlling the temperature of a cellulosic web entering a dryer**

The present invention relates to a method for controlling the temperature of a web, which is formed from cellulosic pulp and is to be passed to a dryer, by way of applying temperature-controlled liquid to the web.

Conventionally, a traveling cellulosic web has been heated by flooding the web with a liquid, whereby uncontrollable penetration of the liquid into the web occurs. As this overflow-flooding step of heating takes place in an open space, it is hampered by problems from the overflow of the liquid and release of expansion steams.

It is an object of the present invention to overcome the above-mentioned problems by virtue of a method characterized by a step of passing the formed web into a closed space defined by two wires and side deckles, wherein temperature-controlled liquid is applied at controlled pressure and flow rate through the wire into the web.

Generally, the closed spaced remaining between the wires is maintained at a moderate positive pressure. The method according to the invention is capable of controllably setting the web temperature at a desired level, e.g., close to 100 °C, thus improving water removal from the web in the press section next downstream of the closed space, whereby the web is maximally hot and has a high solids content at the instant the web enters the dryer section. Furthermore, the method according to the invention may be applied generally in the temperature control of a web, even for cooling, thus making it possible to set the web temperature optimally for drying a cellulosic web. The method also facilitates addition of chemicals into the web in order to improve the qualities of the web.

According to the invention, the liquid can be applied advantageously via a box to the web, either from the underside of the lower wire or from the top side of the upper wire or, alternatively, from both sides either simultaneously or alternately. The penetration of the liquid being applied into the web may be improved if so desired by way of maintaining a pressure difference between the liquid application point and the

side of the web opposite to the application point. This arrangement can be accomplished using, e.g., suction boxes that are located on the opposite side of the web relative to the liquid application point, substantially aligned with said point.

- 5 There may be located a plurality of liquid feed points above or below the web or in alternating positions both above and below the web.

As the web enters the closed space between the wires, its solids content is in a range of about 0.5 % to about 4.0 %, while the solids content is in a range of about 20 % to  
10 about 30 % when the web exits the closed space and enters the press section.

In the following, the invention will be described in greater detail by making reference to the appended drawing showing a schematic side elevation view of an apparatus layout suitable for implementing the method according to the invention.

15

The method employs a twin-wire machine having a bottom wire 1 and top wire 2. Cellulosic pulp is fed into the headbox 3 of the twin-wire machine, wherefrom the pulp flows as a uniform sheet into a closed space 4 defined by the bottom wire 1 and the top wire 2 in cooperation with side deckles (not shown), wherein a web 5 is  
20 formed. When entering this closed space 4, the solids content of the web is typically in a range of about 0.5 % to about 4.0 %. This closed space 4 is generally maintained at a moderate positive pressure.

In order to control the temperature of the web 5 to a desired level, below the bottom  
25 wire 1 and/or above the top wire 2 are placed liquid feed points 6, 7, 10 wherefrom to the web 5 is applied a liquid advantageously via a box at a controlled temperature, pressure and flow rate. As shown in the drawing, the liquid is applied to the web 5 first from below the bottom wire 1 at liquid feed points 6 and 10, whereupon liquid application takes place from above the top wire 2 at liquid feed points 7. Obviously,  
30 the apparatus may incorporate more liquid feed points either above or below the web or in alternating positions both above and below the web.

When necessary, the penetration of the liquid being applied into the web 5 can be improved by means of suction boxes 8, 9 adapted to operate opposite to some or each one of the liquid feed points 6, 7, 10, substantially aligned with the opposed liquid feed point.

5

According to an embodiment of the invention, the web is heated in the method of the invention to a temperature close to 100 °, whereby the removal of water from the web 5 is enhanced in the press section located downstream of the twin-wire region. Resultingly, the temperature and solids content of the web are elevated maximally  
10 high as the web enters the dryer section, whereby drying of the web is speeded up and energy consumption of the dryer is lowered.

Alternatively, the method may also be employed for cooling the web 5 in order to set the temperature of the web 5 to an optimal level for drying a cellulosic web.

15

Furthermore, the method according to the invention facilitates the addition of web quality improving chemicals into the web in conjunction with the liquid being applied to the web, thus allowing the control of, e.g., the pH of the web.

20 When exiting the closed space 4 defined by the wires 1, 2, the solids content of the web has increased reaching from about 20 % to about 30 %.

## Claims:

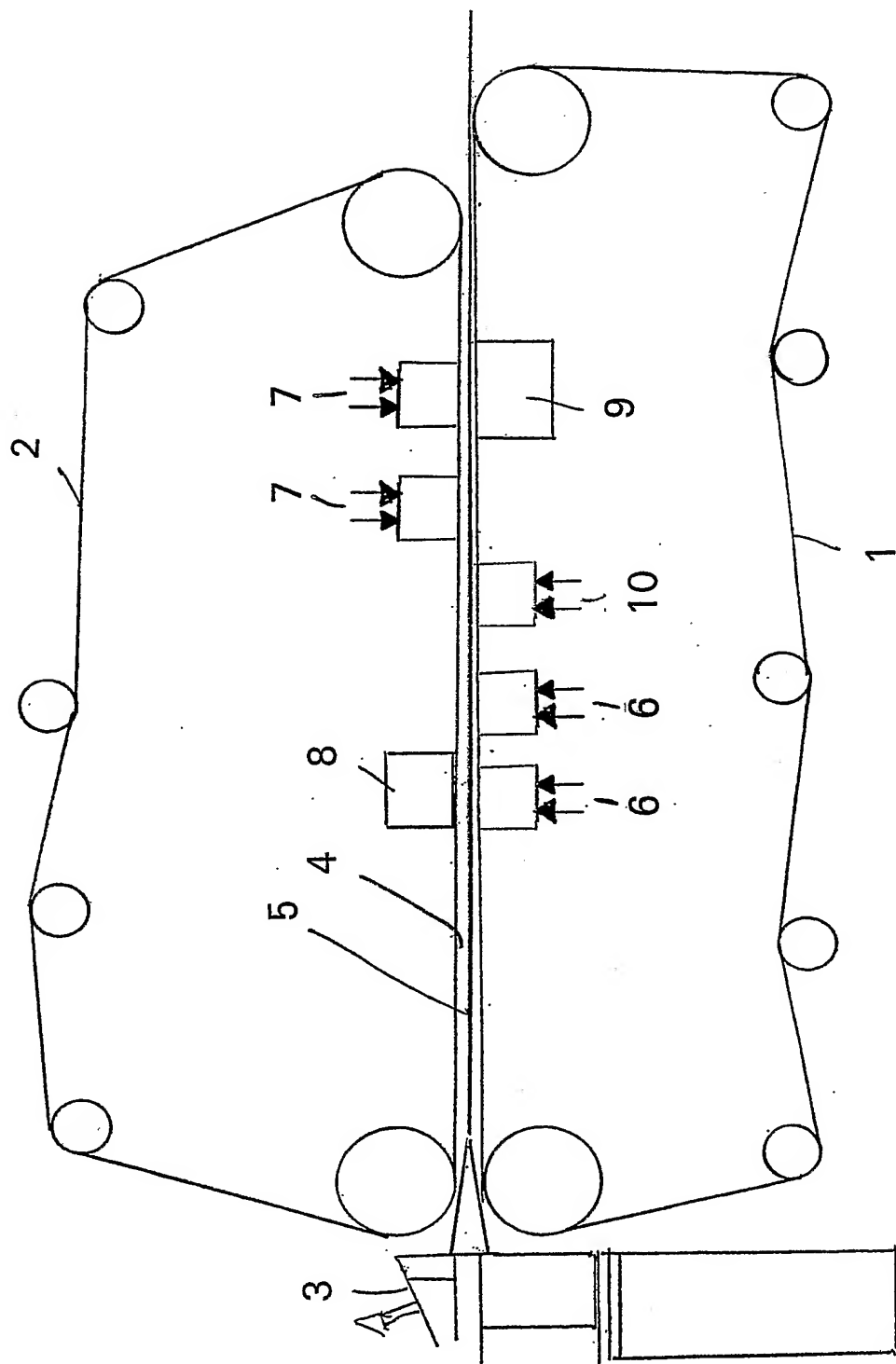
1. A method for controlling the temperature of a web (5), which is formed from cellulosic pulp and is to be passed to a dryer, by way of applying temperature-  
5 controlled liquid to the web, **characterized** in that the thus formed web (5) is passed into a closed space (4) defined by two wires (1, 2) and side deckles, wherein temperature-controlled liquid (6, 7, 10) is applied at controlled pressure and flow rate through the wire (1, 2) to the web (5).
- 10 2. Method according to claim 1, **characterized** in that in the closed space (4) between the wires (1, 2) a moderate positive pressure is maintained.
3. Method according to claim 1, **characterized** in that liquid (6, 10; 7) is applied to the web (5) from below the bottom wire (1) and/or from above the top wire (2).
- 15 4. Method according to claim 3, **characterized** in that the penetration of the liquid being applied into the web (5) is improved by maintaining a pressure difference between the opposite sides of the web.
- 20 5. Method according to any of the previous claims, **characterized** in that the temperature of the web (5) is elevated substantially close to 100 °C.
6. Method according to any of the previous claims 4 - 5, **characterized** in that, in order to establish said pressure difference, a suction box (8, 9) is adapted to operate  
25 opposite to some or each one of said liquid feed points (6, 7, 10) on the other side of the web, substantially aligned with said liquid feed point.
7. Method according to any of the previous claims, **characterized** in that chemicals are added to the web (5) in conjunction with the liquid application in order to  
30 improve the qualities of the web.

8. Method according to claim 7, **characterized** in that the liquid application to the web (5) is adapted to take place at several successive points (6, 10; 7).

5 9. Method according to claim 8, **characterized** in that the liquid is applied alternatingly from above and from below the web.

10. Method according to any of the foregoing claims, **characterized** in that the solids content of the ingoing web (5) is about 0.5 - 4.0 % and the solids of the outgoing web prior to its entry into the dryer is about 20 - 30 %.

1/1



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 03/00627

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: D21F 1/00, D21F 7/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9955958 A1 (ANDRITZ-PATENTVERWALTUNGS-GESELLSCHAFT MBH), 4 November 1999 (04.11.99), page 4, line 25 - page 5, line 17, figures 2,3  -- -----	1-6

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

28 October 2003

Date of mailing of the international search report

29-10-2003

Name and mailing address of the ISA/  
Swedish Patent Office  
Box 5055, S-102 42 STOCKHOLM  
Facsimile No. +46 8 666 02 86

Authorized officer

Olov Jensén/ELY  
Telephone No. +46 8 782 25 00



# INTERNATIONAL SEARCH REPORT

Information on patent family members

06/09/03

International application No.

PCT/FI 03/00627

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	9955958	A1	04/11/99	AT	3205 U	25/11/99
				AT	71698 A	15/09/99
				AT	406394 B	25/04/00
				AU	4035099 A	16/11/99
				EP	0999357 A,B	10/05/00
				FI	992787 A	27/12/99
				SE	9904384 A	01/02/00
-----						

**DERWENT-ACC-NO:** 2004-239218

**DERWENT-WEEK:** 200761

*COPYRIGHT 2008 DERWENT INFORMATION LTD*

**TITLE:** Controlling of temperature of web formed from cellulosic pulp, by passing the web into closed space defined by wires and side deckles, such that temperature-controlled liquid is applied at controlled pressure and flow rate

**INVENTOR:** SAKARI V

**PATENT-ASSIGNEE:** METSO PAPER INC[VALY]

**PRIORITY-DATA:** 2002FI-001535 (August 28, 2002)

**PATENT-FAMILY:**

<b>PUB-NO</b>	<b>PUB-DATE</b>	<b>LANGUAGE</b>
WO 2004020735 A1	March 11, 2004	EN
FI 200201535 A	February 29, 2004	FI
AU 2003255552 A1	March 19, 2004	EN
EP 1543195 A1	June 22, 2005	EN
FI 115643 B1	June 15, 2005	FI
US 20060162891 A1	July 27, 2006	EN
EP 1543195 B1	July 18, 2007	EN
DE 60315046 E	August 30, 2007	DE

**DESIGNATED-STATES:** AE AG AL AM AT AU AZ BA BB BG BR  
 BY BZ CA CH CN CO CR CU CZ DE DK  
 DM DZ EC EE ES FI GB GD GE GH GM  
 HR HU ID IL IN IS JP KE KG KP KR KZ  
 LC LK LR LS LT LU LV MA MD MG MK  
 MN MW MX MZ NI NO NZ OM PG PH PL  
 PT RO RU S C SD SE SG SK SL SY TJ TM  
 TN TR TT TZ UA UG US UZ VC VN YU  
 ZA ZM ZW AT BE BG CH CY CZ DE DK  
 EA EE ES FI FR GB GH GM GR HU IE IT  
 KE LS LU MC MW MZ NL OA PT RO SD  
 SE SI SK SL SZ TR TZ UG ZM ZW AL AT  
 BE BG CH CY CZ DE DK EE ES FI FR GB  
 GR HU IE IT LI LT LU L V MC MK NL PT  
 RO SE SI SK TR AT BE BG CH CY CZ DE  
 DK EE ES FI FR GB GR HU IE IT LI LU  
 MC NL PT RO SE SI SK TR

**APPLICATION-DATA:**

<b>PUB-NO</b>	<b>APPL-DESCRIPTOR</b>	<b>APPL-NO</b>	<b>APPL-DATE</b>
WO2004020735A1	N/A	2003WO- FI00627	August 27, 2003
FI 200201535A	N/A	2002FI- 001535	August 28, 2002
FI 115643B1	N/A	2002FI- 001535	August 28, 2002
AU2003255552A1	N/A	2003AU- 255552	August 27, 2003
DE 60315046E	N/A	2003DE- 615046	August 27, 2003
EP 1543195A1	N/A	2003EP- 790979	August 27, 2003

EP 1543195B1	N/A	2003EP-790979	August 27, 2003
EP 1543195A1	N/A	2003WO-FI00627	August 27, 2003
US20060162891A1	N/A	2003WO-FI00627	August 27, 2003
EP 1543195B1	N/A	2003WO-FI00627	August 27, 2003
DE 60315046E	N/A	2003WO-FI00627	August 27, 2003
US20060162891A1	Based on	2005US-521758	January 19, 2005

**INT-CL-CURRENT:**

<b>TYPE</b>	<b>IPC DATE</b>
CIPP	D21F1/00 20060101
CIPP	D21F1/00 20060101
CIPS	D21F7/00 20060101
CIPS	D21F7/00 20060101
CIPS	D21F7/00 20060101
CIPS	D21F9/00 20060101

**ABSTRACTED-PUB-NO:** WO 2004020735 A1**BASIC-ABSTRACT:**

NOVELTY - A temperature of a web (5) formed from cellulosic pulp and is to be passed to a dryer is controlled by passing the web into a closed space (4) defined by two wires (1, 2) and side deckles, such that temperature-controlled liquid (6, 7, 10) is applied at controlled pressure

and flow rate through the wire to the web.

USE - The method is for controlling the temperature of a web.

ADVANTAGE - The method controls the temperature of the web at a desired level, e.g. close to 100degreesC, thus improving water removal from the web in the press section next downstream of the closed space, in which the web is maximally hot and has high solid content at the instant the web enters the dryer section.

DESCRIPTION OF DRAWING(S) - The method is a schematic view of the twin-wire machine.

Wires (1, 2)

Headbox (3)

Closed space (4)

Web (5)

Liquid feed point (6, 7, 10)

Suction box (8, 9)

## **EQUIVALENT-ABSTRACTS:**

### **TEXTILES AND PAPER**

Preferred Condition: A moderate positive pressure is maintained in the closed space between the wires. The liquid is applied to the web from below the bottom wire and/or from above the top wire. The penetration of the liquid being applied into the web is improved by maintaining a pressure difference between the opposite sides of the web. The temperature of the web is elevated close to 100degreesC. A suction box (8, 9) is adapted to operate opposite to the liquid feed points on the other side of the web to establish pressure difference. Chemicals are added to the web in conjunction with the liquid application to improve the qualities of the web.

The liquid application to the web is adapted to take place at successive points. The liquid is applied alternately from above and from below the web. Preferred Composition: The solids content of the ingoing web is 0.5-4.0%, and the solids of the outgoing web prior to its entry into the dryer is 20-30%.

**CHOSEN-DRAWING:** Dwg.1/1

**TITLE-TERMS:** CONTROL TEMPERATURE WEB FORMING  
CELLULOSIC PULP PASS CLOSE SPACE  
DEFINE WIRE SIDE DECKLE LIQUID  
APPLY PRESSURE FLOW RATE

**DERWENT-CLASS:** F09

**CPI-CODES:** F05-A04C;

**SECONDARY-ACC-NO:**

**CPI Secondary Accession Numbers:** 2004-093697